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ABSTRACT

England's National Vocational Qualifications (NVQs) are statements of competence that are based on national standards for performance in employment. NVQs are organized into five levels of achievement and areas of competence as follows: introductory, trade, technical/craft and supervision, "incorporated" equivalent, and "chartered" equivalent. General NVQs (GNVQs) are designed to be pursued by candidates not yet certain of their career goals or wishing to use the qualifications as a step toward higher education. The primary developers of NVQs are industry lead bodies consisting of employers and key organizations and industrialists. Educators have not yet been significantly involved in development of NVQs. The relationship between NVQs and other standards is unclear. One potential problem regarding NVQs is that they are being developed on an industry-wide basis whereas current academic courses and professional institutions are organized along discipline-based lines. Other emerging problems in the development of NVQs include problems related to underpinning knowledge and understanding, defining competence, and determining the role of assessment and assessors in the NVQ system. Single-discipline educational institutions will soon be faced with applications from candidates holding GNVQs and NVQs and must decide how to use them in the admissions process. (MN)

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TO THE EDUCATIONAL RESOURCES
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National Vocational Qualifications: a review

JOHN AITKEN

Professional institutions may find their roles will change as National Vocational Qualifications (NVQs) become accepted by industry as indicators of competence. The following facts and views are extracted from a report prepared by John Aitken for the IEEE during the period from September 1992 to March 1993.

The need for standards in vocational education and training was recognised as long ago as 1981, in a consultative document. A new training initiative, by the then Manpower Services Commission (MSC). In 1985 the Government established a review group to consider existing arrangements for vocational education and training. The resulting white paper 'Working together in education and training' changed the then MSC to work with industry to identify industry standards that could be embodied in new National Vocational Qualifications. The MSC later became the Training Agency (TA) which was in turn assimilated, in 1990, into the Employment Department in the form of the Training, Enterprise and Education Directorate (TEED). To foster efficient, cost-effective and systematic training based on the new standards the TA/ED invited employers, key organisations and influential individuals within industry to form themselves into industry lead bodies (ILBs).

- Each ILB was required to:
- review all areas of its industry to identify, and prioritise in an action plan, those areas requiring standards development
 - consult all areas of the industry on the acceptability of the standards
 - devise NVQs based on the standards
 - draw up plans for the promotion and adoption of the standards in industry.

It was believed that there was an increasing necessity to develop a skilled and competent workforce and that the training system must be founded on standards and recognised qualifications based on competence and the ability of people to do work successfully and satisfactorily.

The Government is strongly supporting the introduction of these ideas. There is money available from the Government for those developing the standards, but not for those working outside the scheme. Both the National Council for Vocational Qualifications (NCVQ) and the standards programme have been funded by the Government, the latter to the extent of £10 million in each of the last two years. The Government has required Training and Enterprise Councils (TECs) and Local Enterprise Companies (LECs) to meet NVQ standards. Section 24 of

the Education Reform Act will require vocational provision in colleges to be aimed at NVQs. Tax relief is available for individuals pursuing NVQs. Ministers have supported standards-based NVQs strongly in public speeches, and the 'Investors in People' initiative places importance on employers building NVQs into their corporate plans.

National Council for Vocational Qualifications (NCVQ)

The NCVQ was established in 1986 to provide criteria for National Vocational Qualifications and to accredit proposals for NVQs. The remit of the NCVQ does not extend to Scotland where a separate body, the Scottish Vocational Education Council (SCOTVEC), is performing a similar function with broadly similar objectives.

NVQs are competence-based qualifications that are:

- based on national standards for performance in employment
- based on the assessment of the outcomes of learning and independent of the mode, duration or location of the learning experience
- awarded on the basis of valid and reliable assessments that ensure that the national standard can be achieved in the workplace
- free from barriers that restrict access and progression
- available to all who reach the required standard, by whatever means.

NVQs are based on *statements of competence*. All NVQs must consist of an agreed statement of competence which should be determined or endorsed by a lead body with the responsibility for defining, maintaining and approving national standards of performance in the sectors of employment where the competence is practised.

The lead body should be headed by employers, working with employees (including trade unions and education and training advisers).

Competence must be specified in a way that ensures:

- the area of competence has meaning and relevance in the sector of employment concerned

and:

- the competence is broadly comparable with other NVQs at the same level
- the range of competence is broad enough to give flexibility in employment and enhance employment and promotion opportunities
- a basis for progression in the sector and related sectors
- the facilitation of adaptation to meet new and emerging occupational patterns.

The statement of competence must have the following components:

- a title, agreed with NCVQ, which denotes the area of competence and locates it in the NVQ framework
- units of competence, which are the main subdivision of an NVQ. They consist of a coherent group of elements of competence that have meaning and independent value in the relevant area of employment. An NVQ will always have more than one unit, but units must be designed for independent assessment and certification so that they may be separately credited
- elements of competence are subdivisions of units and reflect those things that a person should be able to do at work. They should:
 - (a) relate to what actually happens in the workplace and not activities or skills which are only demonstrated on training programmes
 - (b) be capable of demonstration and assessment
 - (c) describe the outcome of what is done and not the procedures used
 - (d) be expressed in language which makes sense to the people who will use them but which is unambiguous
 - (e) be expressed in terms which apply across different tasks, jobs, equipment or organisational systems
 - (f) represent healthy and safe work practices.
- performance criteria that define the acceptable level of performance required in employment, normally defined in terms of the outcome, although they may contain aspects of the process where this is critical. Performance criteria should:
 - (a) identify only the essential aspects of performance necessary for competence
 - (b) be expressed in such a way that assess-

Table 1

NVQ level	Professional, managerial and technical	Craft, operative
5		
4	Chartered equivalent	
3	Incorporated equivalent	
2	Technician equivalent	Craft and supervision
1		Trade Introductory

ments of performance may be made against them

(c) form an unambiguous basis for the design of assessment systems.

- range statements, which detail the various circumstances in which the competence may be applied in terms of place, employment context or equipment.

In addition, lead bodies are required to provide assessment guidance for each element. This should include a definition of the essential underpinning knowledge and understanding required and the minimum requirements for evidence of performance.

The NVQ framework is a national system for ordering NVQs according to levels of achievement and areas of competence. Currently it divides NVQs into five levels, which may be indicated as follows:

1. Competence in the performance of a range of work activities most of which are routine and predictable
2. Competence in a significant range of varied activities performed in a variety of contexts where some of the activities may be complex or nonroutine and there is some individual responsibility and possibly a requirement to work in a team
3. Competence in a broad range of varied work activities performed in a wide variety of contexts and most of which are complex and nonroutine. The activities involve considerable responsibility, and the control or guidance of others may be involved
4. Competence in a broad range of complex, technical or professional work activities performed in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and allocation of resources is often present
5. Competence that involves the application of a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts. Very substantial personal autonomy and responsibility for the work of others and for the allocation of substantial resources feature strongly, as do personal accountabilities for analysis and diagnosis, design, planning, execution and evaluation.

These levels of qualification will be available in occupations ranging from 'tending plants and animals' to 'developing and extending knowledge' although not all levels will be provided in all sectors. One of these sectors is engineering, and this report is mainly concerned with engineering at levels 4 and 5, as interpreted in Table 1.

General National Vocational Qualifications (GNVQs)

The GNVQ is intended to keep options open for candidates who have not decided on their future career or who wish to use the qualification as a step towards higher education. A GNVQ at level 3 is intended to be equivalent to two A levels plus core skills, and is expected to be undertaken over a two-year full-time period. It will consist of eight mandatory units, four optional units, and three core skills (communications, application of number, and information technology) units. Level 2 GNVQs will comprise six mandatory units and three core skills units. Grading will be based on a portfolio of evidence covering all mandatory, optional and core skill units, but there are externally set tests associated with all mandatory units.

A likely problem in a progression to engineering courses is that the overall grading of the level of skills of the candidate in specific areas such as mathematics.

GNVQs are also being developed and offered by the Business & Technology Education Council (BTEC), the City and Guilds of London Institute (CGLI) and the Royal Society of Arts (RSA). The development of a GNVQ is contracted to one of these three bodies, but it appears that any of them can act as an awarding body for any GNVQ (if they are approved by the NCVQ).

BTEC is strongly promoting GNVQs and will be replacing its First and National Certificates with appropriate GNVQs at levels 2 and 3, respectively. It is also proposing the development of level 4 GNVQs which will replace the BTEC Higher National awards.

Current proposals (all provided at both levels 2 and 3) that may affect engineering include manufacturing (1992), construction (1993) and engineering technology (1994). The dates in brackets represent the first courses, some of which may only be pilots run in a limited number of establishments.

It is interesting to note that, although the purists regard GNVQs as appropriate to candidates who have not yet made a choice of career, many of the proposed courses are directed at specific industries, which is not entirely surprising since they are, by definition, vocational qualifications.

Education and training targets

Foundation learning:

- By 1997, 80% of young people should have achieved NVQ level 2 or its equivalent.
- Training and education to NVQ level 3 (or equivalent) should be available to all young people who can benefit from it.
- By 2000, 50% of young people should have achieved NVQ level 3 or its equivalent.
- Education and training provision should be designed to develop self reliance, flexibility and breadth.

Lifetime learning:

- By 1996, all employees should take part in

training or development activities.

- By 1996, 50% of the workforce should be aiming for NVQs or units within them.
- By 2000, 50% of the workforce should be qualified to at least NVQ level 3 or its equivalent.
- By 1996, 50% of medium and larger organisations should be 'Investors in People'.

NVQs at levels 4 and 5

Within engineering, the development of NVQs at levels 4 and 5 is being carried out by four industry standing conferences (ISCs), namely:

- Construction Industry Standing Conference (CISC)
- Engineering Services Standing Conference (ESSC)
- Standing Conference for Engineering Manufacture (SCEM)
- Standing Conference for Extraction and Processing (SCEP).

The standing conferences consist of representatives from employers, industry lead bodies, trade unions, industry training organisations, engineering institutions and other professional bodies.

The standing conferences have different constitutions and organisational methods, but are all carrying out broadly similar programmes of work. They have been in existence for different periods of time and, as a result, are at different stages in the process.

There is an overarching organisation, the Engineering Occupations Standards Group (EOSG), which is a voluntary association of the four industry standing conferences separately funded by the Employment Department. The aim of the EOSG is to co-ordinate the work of the standing conferences across the whole of the engineering sector.

The engineering pattern of organisation has not been common to all sectors of industry. The Employment Department has become concerned about the proliferation of bodies defining occupational standards (currently over 160) and is proposing that these should be amalgamated into occupational standards councils (OSCs). Although the organisation in engineering has been quoted by the ED as an exemplar, the proposal may lead to a redefinition of the engineering standing conferences as OSCs.

There is some confusion between the roles of the industry lead bodies and the industry standing conferences with respect to the development of standards. In general, the ILBs appear to have been prepared to consider the standards development at levels 4 and 5 to be an appropriate joint exercise with the standing conferences, but in at least one standing conference the confusion has produced some degree of stress.

Developing standards

The process starts with the development of a functional map. This is a top-down process which begins with the definition of a key

function statement describing in a few words the overall function of the industry sector. This statement is then broken down into a series of substatements, each containing more detail of the activities that support the key statement. The process of desegregation continues until there are an agreed set of independent elements, each of which describes a particular function connected with the work of the industry. The functional map is then presented for consultation to interested bodies and, on the basis of that consultation, it is refined to include additional elements and/or amended versions of disputed elements. The production of the functional maps has generally been carried out by working groups, not necessarily themselves members of the ISC, with the help of specially appointed consultants and the officers of the ISC. All the standing conferences are careful to point out that they do not regard the functional maps as definitive but rather as evolutionary and subject to continuing change and refinement.

The EOSG, in its coordinating role, is examining the functional maps produced by the constituent standing conferences in order to ascertain if it is possible to produce a single map for engineering. The proposal to generate an overall map produces some tensions in the standing conferences over the question of ownership of the map. There have, however, been examples of informal co-operation and the exchange of parts of maps between standing conferences.

The next stage in the process is to identify performance criteria (PC) for each element against which a candidate's performance can be measured together with a range statement which defines the range of applications or circumstances in which the element may be appropriate.

Then follows the attachment of a statement of assessment which includes a description of the type and quantity of evidence that is required to demonstrate competence in the element together with a definition of the underpinning knowledge and understanding (UKU) needed to perform the function.

None of the standing conferences has yet progressed beyond this stage, but the CISC, which has been operating for longer than the other three, is about to proceed to the next stage, which involves templating to gather elements into units appropriate to specific job functions which, in turn, may be combined into a set of NVQs appropriate to the industry concerned.

The CISC, which is the furthest ahead, has published a first working draft of its standards, complete with performance criteria and range statements, and is now in the process of trying to define assessment guidance for these standards and to embark on a templating operation which will try to identify units (formed from collections of elements) that are appropriate to define the competences required for specific job functions. These units will then be further combined into appropriate NVQs. No decision has yet been made on the likely format of the

NVQs, although a number of possible alternatives have been proposed.

The ESSC recently published the first version of its functional map and is currently revising this and starting to develop standards.

The SCEP and the SCEM are still in the functional mapping stage but are hoping to present the first versions of their maps at a joint seminar.

Relationship to other qualifications

At levels 4 and 5, the relationship between NVQs and other qualifications is not yet clear. So far, the development has progressed with very little input from the academic world. In fact there has been a policy not to involve academia in the early stages of the process, although the standing conferences stated that there would be an increased involvement of academics starting in the second quarter of 1993. At the lower levels, further education colleges are already involved as training providers, and it is likely that most of the proposed programme of GNVQs will take place in existing academic establishments. It is clear that, for most candidates, the most efficient way of delivering at least the underpinning knowledge is likely to be in reasonably large groups in environments designed for the purpose. It is also very unlikely that the Government, which is currently encouraging expansion of higher education, will wish to close down the current higher education system in favour of a completely work-based system. It seems likely, therefore, that some sort of hybrid will emerge with existing academic courses being modified to take into account the pattern of underpinning knowledge needed by industry-based NVQs and possibly with the extension of the GNVQ concept to the higher levels. It is interesting to note that BTEC is already talking about GNVQs at level 4. The BTEC organisation chart shows these as being precursors of *postgraduate studies*. There do not yet appear to be any firm proposals to define these relationships.

Similarly, the position of NVQs in respect of professional qualifications is still to be resolved. Views range from 'occupational standards should not supplant existing (professional) qualifications' as stated by an Engineering Council representative at a seminar on NVQs, to the idea that appropriate NVQs could form the basis for the formation part of a professional qualification.

- Recent indications are that institutions
- see benefit in the concept of statements of competence and support the rationale of NVQs
 - acknowledge that NVQs represent the future of vocational qualifications
 - have concern over the future of levels 4 and 5
 - feel there is a lack of firm policy on the role of NVQs (at levels 4 and 5) and their relationship with professional qualifications.
- Some institutions feel that
- NVQs are being led by dogma without justification

- underpinning knowledge is not the only knowledge required for professional engineers
- NVQs are a threat to their membership
- their prime role is as learned bodies.

There appears to be a difference of opinion on the role of the institutions in the assessment of NVQs; some believe that they should be involved in assessment at the higher levels.

Some institutions have expressed concern over the proliferation of awarding bodies. This was considered to have been a disaster at the lower levels, and they wished to see a more co-ordinated approach at levels 4 and 5. (Currently the decision to accredit an awarding body is taken by the NCVQ, who have, in the past, not wished to be prescriptive and have based decisions solely on competence.)

The Engineering Council has not yet produced a firm policy on the role of NVQs in professional qualification, but is closely monitoring the position.

General

The overall situation in the development of NVQs at levels 4 and 5 is still complex and confused. There appears to be widespread lack of understanding and enthusiasm in industry as a whole. Even the standing conferences do not yet have a clear vision of the eventual outcome, and it appears unlikely that the targets will be met within the stated time scales.

Perhaps the most fundamental question is whether it is appropriate to define the ability of a professional engineer in terms of competence to perform a set of fixed tasks. Most of the people involved seem to be having some difficulty in coming to terms with the concept of creativity in relation to NVQs. At a recent Engineering Council seminar on the review of engineering formation there were a number of comments from individuals indicating that their institutions were having difficulty in relating NVQs to professional qualifications. Some of the statements made were

'We fear that when the occupational standards councils arrive they will sideline Engineering Council activity.'

'With regard to NVQs, the graduate engineer is not concerned with learning outcomes but with problem solving.'

'Who will pay for validation and accreditation of NVQs? Our strength is SARTOR (Standards and Routes to Registration), let us retain it.'

The relationship between NVQs, which are, in principle, industry-based qualifications depending solely on the ability to perform in the workplace, and conventional academic qualifications is very unclear. In general academics have not been significantly involved in the development process to date, and there are clear tensions between academics and industrialists at open seminars.

A problem that will affect both educationists and the professional institutions is that NVQs are being developed on an industry-

wide basis whereas current academic courses and professional institutions are organised on discipline-based lines. This is exemplified by the fact that, in currently published functional maps and standards, it is quite hard to identify the discipline-related activities.

Underpinning knowledge

There is a developing problem relating to underpinning knowledge and understanding (UKU).

Functional elements are intended to be independent and, because of the way in which they are developed on an industry-wide basis, are usually fairly generic. However it is clear that substantial components of the underpinning knowledge and understanding will be common to a number of elements and, in addition, will be specific rather than generic. The difficulty was illustrated at a recent seminar on defining assessment requirements. Members of working groups could identify the type of direct evidence fairly readily but, when faced with the problem of defining the UKU, tended to fall back on statements such as 'well it's the underpinning knowledge required to perform that function'. Such statements, although correct, do not help either the assessor, who must ensure that the candidate possesses it, or the educator, who must devise courses which will provide it. It is not clear how this conflict will be resolved.

Definition of competence

There is a potential problem in the definition of competence. On reading functional maps, it is hard to take exception to many of the competences that have been identified. The problem comes in the degree of competence required by individuals to enable them to perform adequately. Few human beings are 100% competent in all aspects of their professional life, and, for a professional engineer, the degree of competence required in different aspects of work may vary quite widely from job to job. When templating standards into units, there is a tendency to be inclusive rather than exclusive, and so competences that might be minor or marginal to a job function are included on the basis that 'yes it would be nice if they were able to do that'. If care is not taken, the end result might be that, to achieve an NVQ at these levels, the candidate would have to be a paragon of virtue and ability.

The functional maps already contain very large numbers of elements and, if it becomes necessary to differentiate the degree of competence required in a particular element to fit a range of job specifications (which could be done by redefining the range statement), this could lead to an even greater proliferation of standards. The problem is exacerbated by the fact that individual units will not carry a grading.

Assessment and assessors

In principle, NVQs are based on competence

in the workplace and are assessed in the workplace. If this is carried into practice it is likely to lead to several problems, for example:

- Where will industry find the number of qualified assessors required (assessors should themselves be qualified to appropriate NVQ standards)?
- Will industry be willing to pay the costs of operating assessment schemes? In the existing scheme, the costs of assessment and validation have been hidden within course fees which, in general, have not been paid by industry on a full-cost basis.
- Will smaller firms have the appropriate range of assessment expertise?
- If assessment is spread over a large number of people in a wide range of establishments, how will awarding bodies cope with the magnitude of the validation and/or moderation, required to ensure that consistent standards are maintained?
- If, as seems likely, firms are put under financial pressure to increase the number of staff holding NVQs, will assessment by assessors who are themselves members of the firm, be guaranteed to remain objective and unbiased?
- Will workplace assessors, who may have strong working relationships with colleagues, always maintain an independent and objective view of colleagues' competences?

The role of assessors will be more demanding than in the traditional process. Instead of tests and examinations, assessment will be based on direct observation, simulations, projects and oral questioning. Oral questioning, in particular, requires specific skills to ensure that the questions are comprehensible and identify clearly the knowledge being sought, are appropriate for the level being tested, are confined to the elements described in the standard, and are free of bias on the part of the questioner.

Where assessment is not based on direct observation but on previously accumulated evidence, as for instance in accreditation of prior learning (APL), further additional skills are needed by the assessor. The assessor has more discretion and may need to make subjective rather than objective decisions. The assessment may be made on evidence presented by the candidate, but of which the assessor has no personal experience.

Experience at lower levels

Claire Callender of the Institute of Manpower Studies produced a report for the Employment Department in 1992 entitled 'Will National Vocational Qualifications work?'. This was based on research into the introduction of NVQs into the construction industry. The views expressed were those of Claire Callender herself and do not necessarily represent those of the Institute or the Employment Department. The report makes interesting reading for anyone involved in NVQs. Many of the criticisms raised in the report indicate that the types of problem discussed here are already arising in existing NVQs at lower levels.

The way ahead

The IEEE will need to decide how it is going to react to these developments.

At the least, it will be faced in the near to medium future with applications from candidates holding NVQs. These may be in the form of

- a combination of GNVQs, obtained in educational establishments, together with industry-based NVQs that establish the candidates' competence in particular industries
- a combination of conventional educational qualifications with industry-based NVQs
- a set of totally industry-based NVQs.

The last case may present the most difficulty, since it will be necessary to decide whether the possession of a qualification that defines competence in a particular job situation, and which may be based on performance criteria defined in fairly generic terms, will ensure the base of knowledge and ability appropriate to an Incorporated Engineer in a single discipline.

At the other end of the spectrum, the IEEE, along with other single-discipline institutions, may find itself driven into a position where it ceases to be a qualifying body and concentrates on the learned society aspects of its current activities while the qualification aspects are dealt with by an overarching multidisciplinary body.

There is a question of the possible role of institutions as awarding bodies in the NVQ sense of the term. Although this role is often mentioned, it is not easy to decide whether it is either possible or appropriate. This is partly due to the likely cross-disciplinary nature of NVQs at levels 4 and 5 and partly due to the organisational implications. It is also not yet clear whether there will be a free-for-all approach to the designation of awarding bodies or an attempt to limit them to a small number of organisations. There are currently, for instance, suggestions that the occupational standards councils may become the awarding bodies in engineering whereas others see a role for the professional institutions and/or The Engineering Council. There would be significant resource and organisational implications for an institution taking on the role of an awarding body. If this role is to be fulfilled by professional institutions, it raises the question of whether it would be appropriate for it to be done by individual institutions or by appropriate consortia.

The earlier sections of this article are factual and have been compiled from published documents. Official statements have been interpreted as fairly as possible. Some statements on intended progress may now have been overtaken by time. Views expressed within the article are those of the author for the guidance of members; they are not necessarily endorsed by the IEEE.

John Aitken was engaged as a consultant by the IEEE to prepare the report on which this article is based.